

Attachment A1
Haverhill Coke Company, RCFA's Completed



SunCoke Energy Environmental RCFA Report

SunCoke Energy
The Higher Degree

RCFA Name:	20170715_HHO_014_HRSG4_ PS_Lid_Open	Report Date:	07/15/2017
Report #:	7059	Site:	HH
RCFA Facilitator:	JAWATKINS	Location:	H-6104
RCFA Type:	Environmental	Location name:	HRSG 04, RENTECH, BATTERY B
Date of Occurrence:	Jul 15, 2017, 7:55 AM	Investigation Completed:	08/04/2017

Section1 - General Information

Executive Summary:
This bypass venting event is a result of Redundant HRSG Tie in Time on HCC 1. Per paragraph 20.d. of the Consent Decree, information outlined in Paragraph 20.f. through 20.i. is not required to be completed for bypass venting events that are a result of Redundant HRSG Tie In Time. Please note that the HRSG #4 bypass vent stack lids were open for 16 minutes during this bypass venting event; however, on July 16, 2017, additional bypass venting not related to the July 15 bypass venting event occurred on HCC 1 in excess of 30 minutes per 24-hour period. This additional bypass venting on July 16, 2017 triggered the requirement for completing an RCFA for the July 15, 2017 event.



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Section 1a) Environmental Information

Did the stack lid bypass event result from planned FGD or HRSG maintenance?	No
Describe: The bypass venting event occurred due to either a loss of air or an erroneous proximity switch reading.	

Were charge weights to affected ovens reduced to a 42.5 wet tons/oven average 48 hours prior to venting?	No
If no, provide explanation of why the charge weights were not reduced to a 42.5 wet ton average.	
Explanation: Bypass venting was a result of unplanned maintenance; therefore, charge weights could not be reduced at least 48 hours in advance. HRSG Bypass Venting was not expected to exceed 24 hours. Per the PMO plan, coal charge weights are reduced by approximately two tons per charging cycle during bypass venting events that are expected to exceed 24 hours.	

Did the coal charged during the bypass event contain less than 1.1% sulfur content?	Yes
If no, provide explanation of why the coal sulfur content was not reduced to a maximum of 1.1%.	
Explanation:	

Did multiple events involving stack lid open time occur within a 24 period?	Yes
If yes, please list the Maximo RCFA numbers here:	7061

P901					
Vent Stack No.	#1	#2	#3	#4	#5
Stack Lid Open Date/Time				7/15/17 07:55	
Stack Lid Close Date/Time				7/15/17 8:11	
Total Bypass Venting Time (mins)	0	0	0	16	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.27	0.00

P902					
Vent Stack No.	#6	#7	#8	#9	#10
Stack Lid Open Date/Time					
Stack Lid Close Date/Time					
Total Bypass Venting Time (mins)	0	0	0	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.00	0.00

Estimated Quantity of Emissions (tons)						
Pollutant:	Lead	0.0	PM	0.0	SO ₂	0.0

Estimated Avg Coal Sulfur Content Charged Per Day (applies to all ovens charged each day):					
Date	Avg S (%):		Date	Avg S (%):	
7/13/2017	0.79		7/15/2017	0.83	
7/14/2017	0.90				

Estimated Avg Charge Tons per Oven Charged (avg over duration of event):					
No.	Estimated Avg Coal Charge Weight/		No.	Estimated Avg Coal Charge Weight/	
62	44.35		61	42.67	
66	44.38		65	42.84	
70	44.47		69	42.74	
74	44.74		73	42.76	
78	44.47		77	42.71	
64	40.24		63	41.42	
68	40.79		67	40.44	
72	40.81		71	40.94	
76	40.65		75	40.65	
80	40.77		79	40.72	

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 1

Emission Factors (for one bypass vent stack):

Lead	0.141 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	156.1 lb/hr	Calculated from 2nd Half CEMs Data

Corresponding RCFA Report: 20170715_HHO_014_HRSG4_PS_Lid_Open (7059)

Start Date/Time of Bypass Venting: 7/15/2017 7:55

End Date/Time of Bypass Venting: 7/15/2017 8:11

Bypass Vent Stack Lid Open and Close Date/Time:

	#1	#2	#3	#4	#5
Open Date/Time:				7/15/17 07:55	
Close Date/Time:				7/15/17 8:11	

Total Stack Lid Open Time per Bypass Vent Stack:

	#1	#2	#3	#4	#5
Hours:	0.0	0.0	0.0	0.3	0.0
Minutes:	0	0	0	16	0

Total Bypass Venting Time:

Hours: 0.3

Minutes: 16

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#1	#2	#3	#4	#5
Lead (lbs)	0.0	0.0	0.0	0.0	0.0
PM (lbs)	0.0	0.0	0.0	4.7	0.0
SO ₂ (lbs)	0.0	0.0	0.0	41.6	0.0

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total lbs of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.0



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RCFA Name:	20170716_HHO_015_HRSG1_Failed_Solenoid	Report Date:	07/16/2017
Report #:	7061	Site:	HH
RCFA Facilitator:	JAWATKINS	Location:	H-6101
RCFA Type:	Environmental	Location name:	HRSG 01, RENTECH, BATTERY A
Date of Occurrence:	Jul 16, 2017, 4:42 AM	Investigation Completed:	08/04/2017

Section1 - General Information

Executive Summary:
This bypass venting event is a result of Redundant HRSG Tie in Time on HCC 1. Per paragraph 20.d. of the Consent Decree, information outlined in Paragraph 20.f. through 20.i. is not required to be completed for bypass venting events that are a result of Redundant HRSG Tie In Time. Please note that the HRSG #1 bypass vent stack lids were open for 28 minutes during this bypass venting event; however, on July 15, 2017, additional bypass venting not related to the July 16 bypass venting event occurred on HCC 1 in excess of 30 minutes per 24-hour period. This additional bypass venting on July 15, 2017 triggered the requirement for completing an RCFA for the July 16, 2017 event.



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Section 1a) Environmental Information

Did the stack lid bypass event result from planned FGD or HRSG maintenance?	No
Describe: The bypass venting event occurred due to the stack lid solenoids deenergizing as a result of a blown fuse.	

Were charge weights to affected ovens reduced to a 42.5 wet tons/oven average 48 hours prior to venting?	No
If no, provide explanation of why the charge weights were not reduced to a 42.5 wet ton average.	
Explanation: Bypass venting was a result of unplanned maintenance; therefore, charge weights could not be reduced at least 48 hours in advance. HRSG Bypass Venting was not expected to exceed 24 hours. Per the PMO plan, coal charge weights are reduced by approximately two tons per charging cycle during bypass venting events that are expected to exceed 24 hours.	

Did the coal charged during the bypass event contain less than 1.1% sulfur content?	Yes
If no, provide explanation of why the coal sulfur content was not reduced to a maximum of 1.1%.	
Explanation:	

Did multiple events involving stack lid open time occur within a 24 period?	Yes
If yes, please list the Maximo RCFA numbers here:	7059

P901					
Vent Stack No.	#1	#2	#3	#4	#5
Stack Lid Open Date/Time	7/16/17 04:42				
Stack Lid Close Date/Time	7/16/17 5:10				
Total Bypass Venting Time (mins)	28	0	0	0	0
Total Bypass Venting Time (hrs)	0.47	0.00	0.00	0.00	0.00

P902					
Vent Stack No.	#6	#7	#8	#9	#10
Stack Lid Open Date/Time					
Stack Lid Close Date/Time					
Total Bypass Venting Time (mins)	0	0	0	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.00	0.00

Estimated Quantity of Emissions (tons)						
Pollutant:	Lead	0.0	PM	0.0	SO ₂	0.0

Estimated Avg Coal Sulfur Content Charged Per Day (applies to all ovens charged each day):					
Date	Avg S (%):		Date	Avg S (%):	
7/14/2017	0.90		7/16/2017	0.94	
7/15/2017	0.83				

Estimated Avg Charge Tons per Oven Charged (avg over duration of event):					
No.	Estimated Avg Coal Charge Weight/		No.	Estimated Avg Coal Charge Weight/	
1	43.17		2	44.41	
5	43.22		6	44.21	
9	43.71		10	44.38	
13	43.39		14	44.48	
17	43.77		18	44.40	
3	41.63		4	41.15	
7	41.73		8	41.24	
11	41.65		12	41.22	
15	41.68		16	41.03	
19	41.87		20	41.32	

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 1

Emission Factors (for one bypass vent stack):

Lead	0.141 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	156.1 lb/hr	Calculated from 2nd Half CEMs Data

Corresponding RCFA Report: 20170716_HHO_015_HRSG1_Failed_Solenoid

Start Date/Time of Bypass Venting: 7/16/2017 4:42

End Date/Time of Bypass Venting: 7/16/2017 5:10

Bypass Vent Stack Lid Open and Close Date/Time:

	#1	#2	#3	#4	#5
Open Date/Time:	7/16/17 04:42				
Close Date/Time:	7/16/17 5:10				

Total Stack Lid Open Time per Bypass Vent Stack:

	#1	#2	#3	#4	#5
Hours:	0.5	0.0	0.0	0.0	0.0
Minutes:	28	0	0	0	0

Total Bypass Venting Time:

Hours: 0.5

Minutes: 28

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#1	#2	#3	#4	#5
Lead (lbs)	0.1	0.0	0.0	0.0	0.0
PM (lbs)	8.3	0.0	0.0	0.0	0.0
SO ₂ (lbs)	72.8	0.0	0.0	0.0	0.0

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total lbs of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.0



SunCoke Energy Environmental RCFA Report

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RCFA Name:	20170719_ HHO_016_HRSG4_Stack_Lid_ Maintenance	Report Date:	07/19/2017
Report #:	7109	Site:	HH
RCFA Facilitator:	DMSTARKWEATHER	Location:	H-6104
RCFA Type:	Environmental	Location name:	HRSG 04, RENTECH, BATTERY B
Date of Occurrence:	Jul 19, 2017, 7:47 PM	Investigation Completed:	07/26/2017

Section1 - General Information

Executive Summary:

This bypass venting event is a result of Redundant HRSG Tie in Time on HCC 1. Per paragraph 20.d. of the Consent Decree, information outlined in Paragraph 20.f. through 20.i. is not required to be completed for bypass venting events that are a result of Redundant HRSG Tie In Time.



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Section 1a) Environmental Information

Did the stack lid bypass event result from planned FGD or HRSG maintenance?	No
Describe: The Bypass Venting Event was a result of conducting preventative maintenance of the HRSG #4 Stack Lids.	

Were charge weights to affected ovens reduced to a 42.5 wet tons/oven average 48 hours prior to venting?	No
If no, provide explanation of why the charge weights were not reduced to a 42.5 wet ton average.	
Explanation: Bypass venting was a result of unplanned maintenance; therefore, charge weights could not be reduced at least 48 hours in advance. HRSG Bypass Venting was not expected to exceed 24 hours. Per the PMO plan, coal charge weights are reduced by approximately two tons per charging cycle during bypass venting events that are expected to exceed 24 hours.	

Did the coal charged during the bypass event contain less than 1.1% sulfur content?	Yes
If no, provide explanation of why the coal sulfur content was not reduced to a maximum of 1.1%.	
Explanation:	

Did multiple events involving stack lid open time occur within a 24 period?	No
If yes, please list the Maximo RCFA numbers here:	

P901					
Vent Stack No.	#1	#2	#3	#4	#5
Stack Lid Open Date/Time				7/19/2017 19:47	
Stack Lid Close Date/Time				7/19/2017 21:51	
Total Bypass Venting Time (mins)	0	0	0	102	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	1.70	0.00

P902					
Vent Stack No.	#6	#7	#8	#9	#10
Stack Lid Open Date/Time					
Stack Lid Close Date/Time					
Total Bypass Venting Time (mins)	0	0	0	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.00	0.00

Estimated Quantity of Emissions (tons)						
Pollutant:	Lead	0.0	PM	0.0	SO ₂	0.1

Estimated Avg Coal Sulfur Content Charged Per Day (applies to all ovens charged each day):					
Date	Avg S (%):		Date	Avg S (%):	
7/18/2017	0.90		7/15/2017	0.83	
7/19/2017	0.80				

Estimated Avg Charge Tons per Oven Charged (avg over duration of event):					
No.	Estimated Avg Coal Charge Weight/		No.	Estimated Avg Coal Charge Weight/	
62	44.81		61	43.99	
66	44.79		65	43.75	
70	44.83		69	43.61	
74	44.98		73	43.75	
78	44.69		77	43.75	
64	42.29		63	41.88	
68	42.26		67	41.68	
72	42.26		71	41.82	
76	42.31		75	41.95	
80	42.23		79	42.53	

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 1

Emission Factors (for one bypass vent stack):

Lead	0.141 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	156.1 lb/hr	Calculated from 2nd Half CEMs Data

Corresponding RCFA Report: 20170719_HHO_016_HRSG4_Stack_Lid_Replacement (7109)

Start Date/Time of Bypass Venting: 7/19/2017 19:47

End Date/Time of Bypass Venting: 7/19/2017 21:51

Bypass Vent Stack Lid Open and Close Date/Time:

	#1	#2	#3	#4	#5
Open Date/Time:				7/19/2017 19:47	
Close Date/Time:				7/19/2017 20:24	

Total Stack Lid Open Time per Bypass Vent Stack:

	#1	#2	#3	#4	#5
Hours:	0.0	0.0	0.0	0.6	0.0
Minutes:	0	0	0	37	0

Total Bypass Venting Time:

Hours: 0.6

Minutes: 37

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#1	#2	#3	#4	#5
Lead (lbs)	0.0	0.0	0.0	0.1	0.0
PM (lbs)	0.0	0.0	0.0	11.0	0.0
SO ₂ (lbs)	0.0	0.0	0.0	96.3	0.0

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total lbs of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.0

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 1

Emission Factors (for one bypass vent stack):

Lead	0.141 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	156.1 lb/hr	Calculated from 2nd Half CEMs Data

Corresponding RCFA Report: 20170719_HHO_016_HRSG4_Stack_Lid_Replacement (7109)

Start Date/Time of Bypass Venting: 7/19/2017 19:47

End Date/Time of Bypass Venting: 7/19/2017 21:51

Bypass Vent Stack Lid Open and Close Date/Time:

	#1	#2	#3	#4	#5
Open Date/Time:				7/19/2017 20:39	
Close Date/Time:				7/19/2017 21:41	

Total Stack Lid Open Time per Bypass Vent Stack:

	#1	#2	#3	#4	#5
Hours:	0.0	0.0	0.0	1.0	0.0
Minutes:	0	0	0	62	0

Total Bypass Venting Time:

Hours: 1.0

Minutes: 62

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#1	#2	#3	#4	#5
Lead (lbs)	0.0	0.0	0.0	0.1	0.0
PM (lbs)	0.0	0.0	0.0	18.4	0.0
SO ₂ (lbs)	0.0	0.0	0.0	161.3	0.0

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total lbs of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.1

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 1

Emission Factors (for one bypass vent stack):

Lead	0.141 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	156.1 lb/hr	Calculated from 2nd Half CEMs Data

Corresponding RCFA Report: 20170719_HHO_016_HRSG4_Stack_Lid_Replacement (7109)

Start Date/Time of Bypass Venting: 7/19/2017 19:47

End Date/Time of Bypass Venting: 7/19/2017 21:51

Bypass Vent Stack Lid Open and Close Date/Time:

	#1	#2	#3	#4	#5
Open Date/Time:				7/19/2017 21:48	
Close Date/Time:				7/19/2017 21:51	

Total Stack Lid Open Time per Bypass Vent Stack:

	#1	#2	#3	#4	#5
Hours:	0.0	0.0	0.0	0.0	0.0
Minutes:	0	0	0	3	0

Total Bypass Venting Time:

Hours: 0.0

Minutes: 3

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#1	#2	#3	#4	#5
Lead (lbs)	0.0	0.0	0.0	0.0	0.0
PM (lbs)	0.0	0.0	0.0	0.9	0.0
SO ₂ (lbs)	0.0	0.0	0.0	7.8	0.0

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total lbs of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.0



SunCoke Energy Environmental RCFA Report

SunCoke Energy
The Higher Degree

RCFA Name:	20170818_HHO_017_HCC1_Loss_of_Draft	Report Date:	08/18/2017
Report #:	7273	Site:	HH
RCFA Facilitator:	NDGLOCKNER	Location:	HH2 HRSG
RCFA Type:	Environmental	Location name:	PLANT 2 HRSG
Date of Occurrence:	Aug 18, 2017, 4:06 AM	Investigation Completed:	09/07/2017

Section1 - General Information

Executive Summary:

On August 18, 2017, at 4:07 am, the pressure control valve (PCV) and isolation valve (XV) associated with HRSG 6 - 9 suddenly closed tripping HRSGs 6 - 9 offline. HRSG #10 and #11 remained online. As a result of the HRSG 6 - 9 PCVs and XVs closing, the associated bypass vent stacks opened at 4:07 am on loss of draft. Because HRSGs 10 and 11 continued to operate, a portion of the process gas was shifted to the online HRSGs. The gas sharing system is not designed to handle the process gas from more than one offline HRSG at a time; therefore, this sudden shift in process gas to the remaining online HRSGs caused the HRSG 10 stack pressure to increase above the trip limit. The HRSG 10 bypass vent stack lids opened directly following the HRSGs 6 - 9 vent stack openings.

Operations personnel immediately responded and found that the secondary processor had received a system control error while the primary processor was in a faulted state. When the secondary processor faulted, communication was lost and the PCVs and XVs associated with HRSGs 6-9 closed to prevent potential damage to the HRSGs. Operations personnel immediately reset the faults and brought the processors back online, re-establishing communication with HRSGs 6 – 9 and allowing Operations personnel to begin returning HRSGs 6-10 to service. Please refer to the bypass venting table included in Section 1a of this report for the stack lid open and close times. The total duration of this bypass venting event was 2.97 hours.

The root cause of this bypass venting event was determined to be a system control error occurring in the secondary processor while the primary processor was in a faulted state.

The corrective actions identified for this bypass venting event include clearing the fault of the primary and secondary processors and rebooting the secondary processor. In addition, the error logs for the processors were evaluated by the original equipment manufacturer (OEM).



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Section 1a) Environmental Information

Did the stack lid bypass event result from planned FGD or HRSG maintenance?	No
Describe: The Bypass Venting Event was a result of a loss of draft due to a system control error occurring in the secondary processor while the primary processor was in a faulted state	

Were charge weights to affected ovens reduced to a 42.5 wet tons/oven average 48 hours prior to venting?	No
If no, provide explanation of why the charge weights were not reduced to a 42.5 wet ton average.	
Explanation: Bypass venting was a result of unplanned maintenance; therefore, charge weights could not be reduced at least 48 hours in advance. HRSG Bypass Venting was not expected to exceed 24 hours. Per the PMO plan, coal charge weights are reduced by approximately two tons per charging cycle during bypass venting events that are expected to exceed 24 hours.	

Did the coal charged during the bypass event contain less than 1.1% sulfur content?	Yes
If no, provide explanation of why the coal sulfur content was not reduced to a maximum of 1.1%.	
Explanation:	

Did multiple events involving stack lid open time occur within a 24 period?	No
If yes, please list the Maximo RCFA numbers here:	

P901					
Vent Stack No.	#1	#2	#3	#4	#5
Stack Lid Open Date/Time					
Stack Lid Close Date/Time					
Total Bypass Venting Time (mins)	0	0	0	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.00	0.00

P902					
Vent Stack No.	#6	#7	#8*	#9	#10
Stack Lid Open Date/Time	8/18/2017 4:07	8/18/2017 4:07	8/18/2017 4:07	8/18/2017 4:07	8/18/2017 4:07
Stack Lid Close Date/Time	8/18/17 4:55	8/18/17 4:33	8/18/17 4:44	8/18/17 5:05	8/18/17 4:16
Total Bypass Venting Time (mins)	48	26	37	58	9
Total Bypass Venting Time (hrs)	0.80	0.43	0.62	0.97	0.15

Estimated Quantity of Emissions (tons)						
Pollutant:	Lead	0.0	PM	0.0	SO ₂	0.2

Estimated Avg Coal Sulfur Content Charged Per Day (applies to all ovens charged each day):				
Date	Avg S (%):		Date	Avg S (%):
8/16/2017	0.85		8/18/2017	0.87
8/17/2017	0.97			



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Estimated Avg Charge Tons per Oven Charged (avg over duration of event):				
No.	Estimated Avg Coal Charge Weight/		No.	Estimated Avg Coal Charge Weight/
101	43.80		102	44.35
105	43.76		106	45.10
109	43.37		110	45.61
113	43.61		114	45.25
117	43.34		118	45.20
103	42.38		104	43.58
107	42.38		108	43.92
111	42.96		112	44.16
115	42.62		116	43.59
119	42.88		120	43.65
121	44.07		122	44.71
125	43.51		126	45.24
129	43.39		130	44.79
133	43.47		134	45.15
137	44.07		138	45.03
123	42.67		124	43.53
127	42.45		128	43.90
131	42.36		132	43.82
135	42.40		136	43.65
139	42.41		140	42.72
141	43.35		142	44.97
145	43.12		146	45.20
149	43.12		150	44.76
153	43.24		154	45.05
157	43.29		158	44.88
143	42.40		144	43.85
147	42.40		148	43.71
151	42.59		152	44.04
155	42.57		156	44.24
159	42.60		160	43.82
161	43.41		162	43.99
165	43.81		166	44.89
169	43.47		170	45.19
173	43.92		174	44.89
177	43.68		178	44.83
163	42.67		164	43.77
167	42.62		168	43.77
171	42.57		172	43.71
175	42.60		176	44.28
179	42.60		180	39.82
181	43.68		182	44.36
185	43.77		186	44.72
189	43.77		190	44.53
193	43.35		194	44.61
197	43.71		198	43.83
183	42.55		184	43.97
187	43.17		188	44.06
191	42.94		192	43.37
195	42.93		196	39.83
199	43.05		200	42.83

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 2

Emission Factors (for one bypass vent stack)*:

Lead	0.060 lb/hr	September 2016 Test, HNCC No. 2 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	141.9 lb/hr	Calculated from 2nd Half CEMs Data

Event Description: 20170818_HHO_017_HCC2_Loss_of_Draft (7273)

Start Date/Time of Bypass Venting: 8/18/2017 4:07

End Date/Time of Bypass Venting: 8/18/2017 5:05

Bypass Vent Stack Lid Open and Close Date/Time:

	#6	#7	#8	#9	#10
Open Date/Time:	8/18/2017 4:07	8/18/2017 4:07	8/18/2017 4:07	8/18/2017 4:07	8/18/2017 4:07
Close Date/Time:	8/18/17 4:55	8/18/17 4:33	8/18/17 4:44	8/18/17 5:05	8/18/17 4:16

Total Stack Lid Open Time per Bypass Vent Stack:

	#6	#7	#8	#9	#10
Hours:	0.8	0.4	0.6	1.0	0.1
Minutes:	48.0	26.0	37.0	58.0	9.0

Total Bypass Venting Time:

Hours: 3.0

Minutes: 178

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#6	#7	#8	#9	#10
Lead (lbs)	0.0	0.0	0.0	0.1	0.0
PM (lbs)	14.2	7.7	11.0	17.2	2.7
SO ₂ (lbs)	113.5	61.5	87.5	137.2	21.3

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total tons of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.2



Section 2 - Investigation Information and Summary

Cause and Effect Analysis (include steps taken to minimize emissions, if applicable):

On August 18, 2017, at 4:07 am, the pressure control valve (PCV) and isolation valve (XV) associated with HRSG 6 - 9 suddenly closed tripping HRSGs 6 - 9 offline. HRSG #10 and #11 remained online. As a result of the HRSG 6 - 9 PCVs and XVs closing, the associated bypass vent stacks opened at 4:07 am on loss of draft. Because HRSGs 10 and 11 continued to operate, a portion of the process gas was shifted to the online HRSGs. The gas sharing system is not designed to handle the process gas from more than one offline HRSG at a time; therefore, this sudden shift in process gas to the remaining online HRSGs caused the HRSG 10 stack pressure to increase above the trip limit. The HRSG 10 bypass vent stack lids opened directly following the HRSGs 6 - 9 vent stack openings.

Operations personnel immediately responded and found that the secondary processor had received a system control error while the primary processor was in a faulted state. These processors control HRSGs 6 - 9. When the secondary processor faulted, communication was lost and the PCVs and XVs associated with HRSGs 6-9 closed to prevent potential damage to the HRSGs. Operations personnel immediately reset the faults and brought the processors back online, re-establishing communication with HRSGs 6 - 9 and allowing Operations personnel to begin returning HRSGs 6-10 to service. Please refer to the bypass venting table included in Section 1a of this report for the stack lid open and close times.

The root cause of this bypass venting event was determined to be a system control error occurring in the secondary processor while the primary processor was in a faulted state. The error logs for the processors were provided to the OEM for evaluation. Based on a review of the errors logs by the original equipment manufacturer (OEM), the primary processor appears to have been faulted due to minor corrosion of the plug and socket connections of a cable associated with the "distribution point" remote input/output (I/O). In addition, the OEM found that the secondary processor had faulted due to an ethernet communication loss.

The corrective actions identified for this bypass venting event include clearing the fault of the primary and secondary processors and rebooting the secondary processor. In addition, the error logs for the processors were evaluated by the original equipment manufacturer (OEM). Based on the results of the evaluation, maintenance personnel inspected and cleaned the remote I/O cable, plug, and socket connections associated with primary and secondary processors. Please note that prior to receiving the evaluation from the OEM, maintenance personnel had replaced several parts in an attempt to address the issue, but additional support from the OEM was needed to determine the underlying cause.



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Section 3 - Causes

Cause	Description of Root Cause	Analysis of Root Cause (how did this contribute?)	Type of Cause	Cause Class Repeat?
1557	Primary and Secondary Processors for HRSG #6-#9	The root cause of this bypass venting event was determined to be a system control error occurring in the secondary processor while the primary processor was in a faulted state	Root Cause	Physical Cause NO

Section 4 - Measures Reasonably Available to Prevent or Reduce Likelihood of Recurrence (Corrective Actions)

CA#	Description of Corrective Action	Analysis of Corrective Action
1030447	CD-Clear the fault on the primary and secondary processors and reboot the secondary processor	Allow HRSGs 6-9 to be brought back online
1030448	CD-Send Ovation error log out for analysis by OEM	Request the OEM to review error log and determine cause for processors faulting out. 10/27/2017 MPM Errors lead to loss of Ethernet to Ovation Servers (Drop 200). {Trial repairs successful 10/27/2017}
1030450	CD-Add alarm system for faulted processors	Develop and install an alarm system solely for the operation of the processors throughout the facility.

Additional Corrective Action Information:

CA#	Responsible Person	Probable Effectiveness	Estimated Start Date of CA	Estimated Completion Date	Estimated Cost of Implementation	3rd Party Needed for Implementation?
1030447	MMUHLBAIER	4) Improvement / Unlikely to Prevent	08/08/2017	10/31/2017	0.00	NO
1030448	MMUHLBAIER	5) Impact Cannot be Determined	08/08/2017	12/31/2017	6,500.00	NO
1030450	MMUHLBAIER	4) Improvement / Unlikely to Prevent	08/08/2017	09/30/2018	275,000.00	NO

Action Effectiveness Definition

Value	Description
1) Prevent Reoccurrence	Action will Prevent Reoccurrence
2) Reduce Likelihood	Action will Reduce Likelihood of Reoccurrence
3) Lessen Impact	Action will Lessen Impact of Reoccurrence
4) Improvement / Unlikely to Prevent	An Improvement but not Likely to Prevent Reoccurrence
5) Impact Cannot be Determined	Action Impact Cannot be Determined at this Time



SunCoke Energy Environmental RCFA Report

SunCoke Energy
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RCFA Name:	20170823_ HHO_018_HCC1_LOSS_OF_ DRAFT	Report Date:	08/23/2017
Report #:	7274	Site:	HH
RCFA Facilitator:	KKEVANS	Location:	HH1 HRSG
RCFA Type:	Environmental	Location name:	PLANT 1 HRSG
Date of Occurrence:	Aug 23, 2017, 7:31 PM	Investigation Completed:	09/07/2017

Section1 - General Information

Executive Summary:

This bypass venting event is a result of Redundant HRSG Tie in Time on HCC 1. Per paragraph 20.d. of the Consent Decree, information outlined in Paragraph 20.f. through 20.i. is not required to be completed for bypass venting events that are a result of Redundant HRSG Tie In Time.



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Section 1a) Environmental Information

Did the stack lid bypass event result from planned FGD or HRSG maintenance?	No
Describe: The Bypass Venting Event was a result of a brief disruption in power from the utility provider that caused the HCC1 variable frequency drives for the induced draft fans to trip on phase imbalance.	

Were charge weights to affected ovens reduced to a 42.5 wet tons/oven average 48 hours prior to venting?	No
If no, provide explanation of why the charge weights were not reduced to a 42.5 wet ton average.	
Explanation: Bypass venting was a result of unplanned maintenance; therefore, charge weights could not be reduced at least 48 hours in advance. HRSG Bypass Venting was not expected to exceed 24 hours. Per the PMO plan, coal charge weights are reduced by approximately two tons per charging cycle during bypass venting events that are expected to exceed 24 hours.	

Did the coal charged during the bypass event contain less than 1.1% sulfur content?	Yes
If no, provide explanation of why the coal sulfur content was not reduced to a maximum of 1.1%.	
Explanation:	

Did multiple events involving stack lid open time occur within a 24 period?	No
If yes, please list the Maximo RCFA numbers here:	

P901					
Vent Stack No.	#1	#2	#3	#4	#5
Stack Lid Open Date/Time	8/23/17 19:36	8/23/17 19:36	8/23/17 19:36	8/23/17 19:36	8/23/17 19:36
Stack Lid Close Date/Time	8/23/17 19:51	8/23/17 20:22	8/23/17 19:58	8/23/17 19:49	8/23/17 20:49
Total Bypass Venting Time (mins)	15	46	22	13	73
Total Bypass Venting Time (hrs)	0.25	0.77	0.37	0.22	1.22

P902					
Vent Stack No.	#6	#7	#8	#9	#10
Stack Lid Open Date/Time					
Stack Lid Close Date/Time					
Total Bypass Venting Time (mins)	0	0	0	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.00	0.00

Estimated Quantity of Emissions (tons)						
Pollutant:	Lead	0.0	PM	0.0	SO ₂	0.2

Estimated Avg Coal Sulfur Content Charged Per Day (applies to all ovens charged each day):					
Date	Avg S (%):		Date	Avg S (%):	
8/22/2017	0.90				
8/23/2017	0.94				



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Estimated Avg Charge Tons per Oven Charged (avg over duration of event):

No.	Estimated Avg Coal Charge Weight/	No.	Estimated Avg Coal Charge Weight/
1	43.87	2	44.79
5	42.28	6	44.76
9	42.23	10	44.59
13	42.47	14	-0.23
17	42.45	18	44.71
3	42.96	4	42.83
7	42.60	8	42.65
11	42.71	12	42.89
15	42.84	16	42.89
19	42.84	20	42.98
21	42.21	22	44.64
25	42.28	26	44.73
29	42.28	30	44.57
33	42.24	34	44.86
37	42.81	38	44.26
23	43.00	24	43.03
27	42.91	28	42.86
31	42.65	32	42.67
35	43.18	36	42.65
39	42.69	40	42.69
41	42.64	42	44.76
45	42.24	46	44.62
49	42.40	50	-0.23
53	42.12	54	44.64
57	42.57	58	44.52
43	43.01	44	42.78
47	42.72	48	42.84
51	42.71	52	42.88
55	42.77	56	42.41
59	42.84	60	42.96
61	42.07	62	44.49
65	42.24	66	44.84
69	42.24	70	44.59
73	42.16	74	-0.23
77	42.12	78	44.67
63	42.62	64	42.94
67	42.77	68	43.03
71	42.77	72	42.89
75	42.77	76	42.55
79	42.79	80	42.57
81	42.19	82	44.59
85	42.11	86	44.94
89	42.14	90	44.77
93	42.30	94	44.83
97	42.02	98	-0.23
83	42.77	84	42.89
87	42.71	88	42.98
91	42.77	92	42.88
95	42.57	96	42.93
99	42.64	100	42.62

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 1

Emission Factors (for one bypass vent stack):

Lead	0.141 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	156.1 lb/hr	Calculated from 2nd Half CEMs Data

Corresponding RCFA Report: 20170823_HHO_018_HCC1_Loss_of_Draft (7274)

Start Date/Time of Bypass Venting: 8/23/2017 19:36

End Date/Time of Bypass Venting: 8/23/2017 20:49

Bypass Vent Stack Lid Open and Close Date/Time:

	#1	#2	#3	#4	#5
Open Date/Time:	8/23/17 19:36	8/23/17 19:36	8/23/17 19:36	8/23/17 19:36	8/23/17 19:36
Close Date/Time:	8/23/17 19:51	8/23/17 20:22	8/23/17 19:58	8/23/17 19:49	8/23/17 20:49

Total Stack Lid Open Time per Bypass Vent Stack:

	#1	#2	#3	#4	#5
Hours:	0.2	0.8	0.4	0.2	1.2
Minutes:	15	46	22	13	73

Total Bypass Venting Time:

Hours: 2.8

Minutes: 169

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#1	#2	#3	#4	#5
Lead (lbs)	0.0	0.1	0.1	0.0	0.2
PM (lbs)	4.4	13.6	6.5	3.9	21.7
SO ₂ (lbs)	39.0	119.7	57.2	33.8	189.9

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total lbs of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.2



SunCoke Energy Environmental RCFA Report

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RCFA Name:	20171023_HHO_019_HCC2_ Loss_of_Draft_Tube_Leak	Report Date:	10/23/2017
Report #:	7513	Site:	HH
RCFA Facilitator:	DMSTARKWEATHER	Location:	HH2 HRSG
RCFA Type:	Environmental	Location name:	PLANT 2 HRSG
Date of Occurrence:	Oct 23, 2017, 12:11 PM	Investigation Completed:	11/02/2017

Section1 - General Information

Executive Summary:

On October 23, 2017 at 12:11 pm, a malfunction occurred on the HCC 2 Heat Recovery Steam Generator (HRSG) #8. The Evaporator Tubes 14 and 15, located in Row 10 of Evaporator 2A, failed, allowing water to pass from the tubes inside of the HRSG into the gas path, which was then converted to steam on the outlet side of the boiler. As a result of the added mass flow of water and steam caused by the leaking tube, the HCC 2 ID fans were unable to maintain sufficient draft on the HRSGs 6-10 bypass vent stacks, causing them to open, starting at 12:11 pm.

The control room operator (CRO) responded to the event immediately, removing HRSG #8 from service to allow contractor personnel to repair the leak and closing bypass vent stack lids 6-10. HRSG #8 remained offline once the stack lids were closed. Please refer to the bypass venting table included in Section 1a of this report for the stack lid open and close times. The total duration of the bypass venting event was 0.93 hours.

The root cause of this bypass venting event was determined to be the failed evaporator tubes 14 and 15, located in Row 10 of Evaporator 2a in HRSG #8, which resulted in a large increase in the mass flow to the HCC 2 ID fans, which were unable to respond quickly enough to the resultant water leak and mass flow increase, causing the loss of draft.

The major corrective actions identified for this event include plugging the failed evaporator tubes 14 and 15 of Row 10 of Evaporator 2a in HRSG #8.



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Section 1a) Environmental Information

Did the stack lid bypass event result from planned FGD or HRSG maintenance?	No
Describe: The Bypass Venting Event was a result of a loss of draft.	

Were charge weights to affected ovens reduced to a 42.5 wet tons/oven average 48 hours prior to venting?	No
If no, provide explanation of why the charge weights were not reduced to a 42.5 wet ton average.	
Explanation: Bypass venting was a result of unplanned maintenance; therefore, charge weights could not be reduced at least 48 hours in advance. HRSG Bypass Venting was not expected to exceed 24 hours. Per the PMO plan, coal charge weights are reduced by approximately two tons per charging cycle during bypass venting events that are expected to exceed 24 hours.	

Did the coal charged during the bypass event contain less than 1.1% sulfur content?	Yes
If no, provide explanation of why the coal sulfur content was not reduced to a maximum of 1.1%.	
Explanation:	

Did multiple events involving stack lid open time occur within a 24 period?				No
If yes, please list the Maximo RCFA numbers here:				

P901					
Vent Stack No.	#1	#2	#3	#4	#5
Stack Lid Open Date/Time					
Stack Lid Close Date/Time					
Total Bypass Venting Time (mins)	0	0	0	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.00	0.00

P902					
Vent Stack No.	#6	#7	#8*	#9	#10
Stack Lid Open Date/Time	10/23/2017 12:11	10/23/2017 12:30	10/23/2017 12:11	10/23/2017 12:11	10/23/2017 12:11
Stack Lid Close Date/Time	10/23/17 12:19	10/23/17 12:38	10/23/17 12:21	10/23/17 12:22	10/23/17 12:30
Total Bypass Venting Time (mins)	8	8	10	11	19
Total Bypass Venting Time (hrs)	0.13	0.13	0.17	0.18	0.32

Estimated Quantity of Emissions (tons)						
Pollutant:	Lead	0.0	PM	0.0	SO ₂	0.1

Estimated Avg Coal Sulfur Content Charged Per Day (applies to all ovens charged each day):				
Date	Avg S (%):		Date	Avg S (%):
10/21/2017	0.83		10/23/2017	0.84
10/22/2017	0.97			



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Estimated Avg Charge Tons per Oven Charged (avg over duration of event):				
No.	Estimated Avg Coal Charge Weight/		No.	Estimated Avg Coal Charge Weight/
101	43.71		102	46.01
105	45.64		106	45.65
109	45.33		110	45.59
113	45.52		114	45.72
117	44.90		118	46.35
103	44.94		104	43.84
107	44.71		108	44.11
111	44.82		112	44.51
115	44.53		116	44.18
119	44.42		120	43.84
121	45.76		122	46.05
125	45.84		126	45.79
129	45.64		130	46.05
133	45.74		134	45.79
137	46.32		138	45.53
123	44.41		124	43.04
127	44.46		128	43.18
131	44.00		132	43.18
135	44.08		136	42.61
139	44.51		140	42.32
141	44.56		142	45.86
145	45.91		146	45.64
149	45.93		150	45.65
153	45.64		154	45.76
157	46.41		158	45.55
143	43.88		144	42.46
147	43.98		148	42.71
151	44.03		152	42.39
155	43.69		156	42.29
159	44.12		160	42.53
161	44.71		162	46.21
165	45.79		166	45.72
169	45.71		170	45.77
173	45.72		174	45.45
177	45.84		178	45.36
163	43.82		164	42.59
167	44.46		168	42.17
171	43.84		172	42.27
175	43.86		176	42.32
179	44.10		180	42.22
181	45.65		182	45.79
185	45.82		186	45.96
189	45.88		190	46.17
193	45.43		194	45.74
197	45.77		198	45.47
183	44.01		184	42.46
187	44.08		188	42.42
191	44.01		192	42.29
195	44.01		196	-0.29
199	43.82		200	42.32

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 2

Emission Factors (for one bypass vent stack)*:

Lead	0.060 lb/hr	September 2016 Test, HNCC No. 2 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	141.9 lb/hr	Calculated from 2nd Half CEMs Data

Event Description: 20171023_HHO_019_HCC2_Loss_of_Draft_Tube_Leak (7513)

Start Date/Time of Bypass Venting: 10/23/2017 12:11

End Date/Time of Bypass Venting: 10/23/2017 12:38

Bypass Vent Stack Lid Open and Close Date/Time:

	#6	#7	#8	#9	#10
Open Date/Time:	10/23/2017 12:11	10/23/2017 12:30	10/23/2017 12:11	10/23/2017 12:11	10/23/2017 12:11
Close Date/Time:	10/23/17 12:19	10/23/17 12:38	10/23/17 12:21	10/23/17 12:22	10/23/17 12:30

Total Stack Lid Open Time per Bypass Vent Stack:

	#6	#7	#8	#9	#10
Hours:	0.1	0.1	0.2	0.2	0.3
Minutes:	8.0	8.0	10.0	11.0	19.0

Total Bypass Venting Time:

Hours: 0.9

Minutes: 56

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#6	#7	#8	#9	#10
Lead (lbs)	0.0	0.0	0.0	0.0	0.0
PM (lbs)	2.4	2.4	3.0	3.3	5.6
SO ₂ (lbs)	18.9	18.9	23.6	26.0	44.9

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total tons of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.1



Section 2 - Investigation Information and Summary

Cause and Effect Analysis (include steps taken to minimize emissions, if applicable):

On October 23, 2017 at 12:11 pm, a malfunction occurred on the HCC 2 Heat Recovery Steam Generator (HRSG) #8. The Evaporator Tubes 14 and 15, located in Row 10 of Evaporator 2a, failed, allowing water to pass from the tubes inside of the HRSG into the gas path, which was then converted to steam on the outlet side of the boiler. The Induced Draft (ID) fans could not respond quickly enough to the added mass flow of water and steam caused by the leaking tube resulting in the loss of draft at the HRSGs and associated bypass vent stacks. As a result, the HRSGs 6-10 bypass vent stack lids opened on low draft starting at 12:11 pm.

The control room operator (CRO) responded to the event immediately, removing HRSG #8 from service to allow contractor personnel to repair the leak and closing bypass vent stack lids 6-10. HRSG #8 remained offline once the stack lids were closed.

The root cause of this bypass venting event was determined to be the failed evaporator tubes 14 and 15, located in Row 10 of Evaporator 2a in HRSG #8, which resulted in a large increase in the mass flow to the HCC 2 ID fans, which were unable to respond quickly enough to the resultant water leak and mass flow increase, causing the loss of draft.

The major corrective actions identified for this event include plugging the failed evaporator tubes 14 and 15 of Row 10 of Evaporator 2a in HRSG #8. In addition, HCC has been implementing other processes and procedures to minimize the occurrence of tube leaks and/or the amount of time that a HRSG is down for a tube leak. These processes and procedures include but are not limited to: an advanced tube inspection/tracking program that identifies areas of the boiler that are more prone to corrosion and may require more thorough tube inspections; an additional inspection process that allows personnel to inspect additional boiler tubes when a boiler is down for a tube leak or other unplanned event; the use of soda ash wash; the use of an ultrasonic thickness (UT) testing method to identify thinning tubes in order to target specific areas of the boiler for tube replacements or additional inspections, as needed; an orbital welding process for use on applicable repairs for more even, consistent welds on tubes; and the use of different, more resilient metallurgy in certain boiler sections.

These above processes and procedures were being followed at the time of this leak, so they should not be considered RCFA corrective actions.



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Section 3 - Causes

Cause	Description of Root Cause	Analysis of Root Cause (how did this contribute?)	Type of Cause	Cause Class Repeat?
1573	Tube leak due to corrosion and mechanical stress	The failed evaporator tubes 14 and 15, located in Row 10 of Evaporator 2a in HRSG #8, resulted in a large increase in the mass flow to the HCC 2 ID fans, which were unable to respond quickly enough to the resultant water leak and mass flow increase, causing the loss of draft.	Root Cause	Physical Cause NO

Section 4 - Measures Reasonably Available to Prevent or Reduce Likelihood of Recurrence (Corrective Actions)

CA#	Description of Corrective Action	Analysis of Corrective Action
1042437	CD - Plug failed evaporator tubes 14 and 15, located in Row 10 of Evaporator 2a in HRSG #8	Plugging the failed evaporator tubes 14 and 15, located in Row 10 of Evaporator 2a in HRSG #8 stopped the leak

Additional Corrective Action Information:

CA#	Responsible Person	Probable Effectiveness	Estimated Start Date of CA	Estimated Completion Date	Estimated Cost of Implementation	3rd Party Needed for Implementation?
1042437	DMSTARKWEATHER	2) Reduce Likelihood	10/23/2017	11/30/2017	60,000.00	YES

Action Effectiveness Definition

Value	Description
1) Prevent Reoccurrence	Action will Prevent Reoccurrence
2) Reduce Likelihood	Action will Reduce Likelihood of Reoccurrence
3) Lessen Impact	Action will Lessen Impact of Reoccurrence
4) Improvement / Unlikely to Prevent	An Improvement but not Likely to Prevent Reoccurrence
5) Impact Cannot be Determined	Action Impact Cannot be Determined at this Time



SunCoke Energy Environmental RCFA Report

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The Higher Degree

RCFA Name:	20171110_HHO_020_HRSG8_Tube_Leak	Report Date:	11/10/2017
Report #:	7569	Site:	HH
RCFA Facilitator:	DMSTARKWEATHER	Location:	H-6108
RCFA Type:	Environmental	Location name:	HRSG 08, HEAT RECOVERY STEAM GEN, NOOTER, BATTERY C
Date of Occurrence:	Nov 10, 2017, 9:47 PM	Investigation Completed:	12/01/2017

Section1 - General Information

Executive Summary:

On November 10, 2017, Operations personnel identified a tube leak inside Heat Recovery Steam Generator (HRSG) #8 after the Control Room Operator (CRO) received a low low drum level alarm in the control room, tripping HRSG #8 offline and opening the associated bypass vent stack at 9:47 pm. HRSG #11 was offline for annual maintenance and was not available for gas sharing. Operations personnel adjusted the draft settings for HRSG #8 and closed the lids at 10:37 pm. Contractor personnel were dispatched to make repairs to HRSG #8. The following day, November 11, the HRSG #8 stack lids opened a second time at 6:14 am while Operations personnel were in the process of returning HRSG #11 to service. Operations personnel made additional adjustments to the draft and closed the HRSG #8 bypass vent stack lids at 6:18 am. The total duration of the bypass venting event was 0.90 hours. HRSG #8 remained offline and contractor personnel identified leaks in the HRSG # 8 Economizer in rows 20 - 28.

The root cause of this bypass venting event was determined to be the following failed HRSG #8 economizer tubes: tube 1 in rows 21 – 25 on both the north and south sides of the HRSG; tubes 2 – 3 in rows 21 – 26 of both sides and also in row 27 on the north side only; hair pins 1 -3 in row 20 on the south side only; hair pin 1 in row 26 on the north side only; and hair pins 2 -3 in row 28 on the north side only, while HRSG #11 was offline for maintenance. The initial source of failure was found to be tube 1 in row 25, which subsequently caused damaged to several surrounding tubes.

The major corrective actions identified for this event include replacing the HRSG #8 economizer tubes: tube 1 in rows 21 – 25 on both the north and south sides of the HRSG; tubes 2 – 3 in rows 21 – 26 of both sides and also in row 27 on the north side only; hair pins 1 -3 in row 20 on the south side only; hair pin 1 in row 26 on the north side only; and hair pins 2 -3 in row 28 on the north side only.



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Section 1a) Environmental Information

Did the stack lid bypass event result from planned FGD or HRSG maintenance?	No
Describe: The bypass venting was a result of a tube leak malfunction occurring, while another HRSG was already offline for maintenance.	

Were charge weights to affected ovens reduced to a 42.5 wet tons/oven average 48 hours prior to venting?	No
If no, provide explanation of why the charge weights were not reduced to a 42.5 wet ton average.	
Explanation: Bypass venting was a result of unplanned maintenance; therefore, charge weights could not be reduced at least 48 hours in advance. HRSG Bypass Venting was not expected to exceed 24 hours. Per the PMO plan, coal charge weights are reduced by approximately two tons per charging cycle during bypass venting events that are expected to exceed 24 hours.	

Did the coal charged during the bypass event contain less than 1.1% sulfur content?	Yes
If no, provide explanation of why the coal sulfur content was not reduced to a maximum of 1.1%.	
Explanation:	

Did multiple events involving stack lid open time occur within a 24 period?	Yes
If yes, please list the Maximo RCFA numbers here:	

P901					
Vent Stack No.	#1	#2	#3	#4	#5
Stack Lid Open Date/Time					
Stack Lid Close Date/Time					
Total Bypass Venting Time (mins)	0	0	0	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.00	0.00

P902					
Vent Stack No.	#6	#7	#8	#9	#10
Stack Lid Open Date/Time			11/10/2017 21:47		
Stack Lid Close Date/Time			11/11/2017 6:18		
Total Bypass Venting Time (mins)	0	0	54	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.90	0.00	0.00

Estimated Quantity of Emissions (tons)						
Pollutant:	Lead	0.0	PM	0.0	SO ₂	0.1

Estimated Avg Coal Sulfur Content Charged Per Day (applies to all ovens charged each day):					
Date	Avg S (%):		Date	Avg S (%):	
11/9/2017	0.93		11/11/2017	0.95	
11/10/2017	0.81				

Estimated Avg Charge Tons per Oven Charged (avg over duration of event):					
No.	Estimated Avg Coal Charge Weight/		No.	Estimated Avg Coal Charge Weight/	
141	43.86		142	45.84	
145	43.84		146	45.77	
149	43.82		150	45.81	
153	44.06		154	45.83	
157	43.82		158	45.88	
143	42.29		144	43.50	
147	42.24		148	42.82	
151	42.13		152	42.80	
155	42.15		156	42.85	
159	42.06		160	41.16	

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 2

Emission Factors (for one bypass vent stack)*:

Lead	0.060 lb/hr	September 2016 Test, HNCC No. 2 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	141.9 lb/hr	Calculated from 2nd Half CEMs Data

Event Description: 20171110_HHO_020_HRSG8_Tube_Leak (7569)

Start Date/Time of Bypass Venting: 11/10/2017 21:47

End Date/Time of Bypass Venting: 11/11/2017 6:18

Bypass Vent Stack Lid Open and Close Date/Time:

	#6	#7	#8	#9	#10
Open Date/Time:			11/10/2017 21:47		
Close Date/Time:			11/10/2017 22:37		

Total Stack Lid Open Time per Bypass Vent Stack:

	#6	#7	#8	#9	#10
Hours:	0.0	0.0	0.8	0.0	0.0
Minutes:	0.0	0.0	50.0	0.0	0.0

Total Bypass Venting Time:

Hours: 0.8

Minutes: 50

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#6	#7	#8	#9	#10
Lead (lbs)	0.0	0.0	0.1	0.0	0.0
PM (lbs)	0.0	0.0	14.8	0.0	0.0
SO ₂ (lbs)	0.0	0.0	118.3	0.0	0.0

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total tons of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.1

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 2

Emission Factors (for one bypass vent stack)*:

Lead	0.060 lb/hr	September 2016 Test, HNCC No. 2 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	141.9 lb/hr	Calculated from 2nd Half CEMs Data

Event Description: 20171110_HHO_020_HRSG8_Tube_Leak (7569)

Start Date/Time of Bypass Venting: 11/10/2017 21:47

End Date/Time of Bypass Venting: 11/11/2017 6:18

Bypass Vent Stack Lid Open and Close Date/Time:

	#6	#7	#8	#9	#10
Open Date/Time:			11/11/2017 6:14		
Close Date/Time:			11/11/2017 6:18		

Total Stack Lid Open Time per Bypass Vent Stack:

	#6	#7	#8	#9	#10
Hours:	0.0	0.0	0.1	0.0	0.0
Minutes:	0.0	0.0	4.0	0.0	0.0

Total Bypass Venting Time:

Hours: 0.1

Minutes: 4

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#6	#7	#8	#9	#10
Lead (lbs)	0.0	0.0	0.0	0.0	0.0
PM (lbs)	0.0	0.0	1.2	0.0	0.0
SO ₂ (lbs)	0.0	0.0	9.5	0.0	0.0

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total tons of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.0



Section 2 - Investigation Information and Summary

Cause and Effect Analysis (include steps taken to minimize emissions, if applicable):

On November 10, 2017 Operations personnel identified a tube leak inside Heat Recovery Steam Generator (HRSG) #8 after the Control Room Operator (CRO) received a low low drum level alarm in the control room, tripping HRSG #8 offline and opening the associated bypass vent stack at 9:47 pm. HRSG 11 was offline for annual maintenance and was not available for gas sharing. Operations personnel adjusted the draft settings for HRSG #8 and closed the lids at 10:37 pm. Contractor personnel were dispatched to make repairs to HRSG #8. The following day, November 11, the HRSG #8 stack lids opened a second time at 6:14 am while Operations personnel were in the process of returning HRSG #11 to service. Operations personnel made additional adjustments to the draft and closed the HRSG #8 bypass vent stack lids at 6:18 am.

The root cause of this bypass venting event was determined to be the following failed HRSG #8 economizer tubes: tube 1 in rows 21 – 25 on both the north and south sides of the HRSG; tubes 2 – 3 in rows 21 – 26 of both sides and also in row 27 on the north side only; hair pins 1 -3 in row 20 on the south side only; hair pin 1 in row 26 on the north side only; and hair pins 2 -3 in row 28 on the north side only, while HRSG #11 was offline for maintenance. The initial source of failure was found to be tube 1 in row 25, which subsequently caused damaged to several surrounding tubes.

The major corrective actions identified for this event include replacing the HRSG #8 economizer tubes: tube 1 in rows 21 – 25 on both the north and south sides of the HRSG; tubes 2 – 3 in rows 21 – 26 of both sides and also in row 27 on the north side only; hair pins 1 -3 in row 20 on the south side only; hair pin 1 in row 26 on the north side only; and hair pins 2 -3 in row 28 on the north side only.

HCC has been implementing other processes and procedures to minimize the occurrence of tube leaks and/or the amount of time that a HRSG is down for a tube leak. These processes and procedures include but are not limited to: an advanced tube inspection/tracking program that identifies areas of the boiler that are more prone to corrosion and may require more thorough tube inspections; an additional inspection process that allows personnel to inspect additional boiler tubes when a boiler is down for a tube leak or other unplanned event; the use of soda ash wash; the use of an ultrasonic thickness (UT) testing method to identify thinning tubes in order to target specific areas of the boiler for tube replacements or additional inspections, as needed; an orbital welding process for use on applicable repairs for more even, consistent welds on tubes; and the use of different, more resilient metallurgy in certain boiler sections.

These above processes and procedures were being followed at the time of this leak, so they should not be considered RCFA corrective actions.



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Section 3 - Causes

Cause	Description of Root Cause	Analysis of Root Cause (how did this contribute?)	Type of Cause	Cause Class Repeat?
1581	HRSG #8 Tube Failure while HRSG 11 was offline	The root cause of this bypass venting event was determined to be the following failed HRSG #8 economizer tubes: tube 1 in rows 21 – 25 on both the north and south sides of the HRSG; tubes 2 – 3 in rows 21 – 26 of both sides and also in row 27 on the north side only; hair pins 1 -3 in row 20 on the south side only; hair pin 1 in row 26 on the north side only; and hair pins 2 -3 in row 28 on the north side only, while HRSG #11 was offline for maintenance. The initial source of failure was found to be tube 1 in row 25, which subsequently caused damaged to several surrounding tubes. The tubes failing while HRSG #11 was offline for maintenance restricted the ability to gas share and keep all of the emergency bypass vent stacks closed.	Root Cause	Physical Cause NO

Section 4 - Measures Reasonably Available to Prevent or Reduce Likelihood of Recurrence (Corrective Actions)

CA#	Description of Corrective Action	Analysis of Corrective Action
1049854	CD - Replace failed economizer tubes and hairpins (see report for locations)	Replacing the failed economizer tubes and hairpins stopped the leak.

Additional Corrective Action Information:

CA#	Responsible Person	Probable Effectiveness	Estimated Start Date of CA	Estimated Completion Date	Estimated Cost of Implementation	3rd Party Needed for Implementation?
1049854	DMSTARKWEATHER	Reduce Likelihood	11/10/2017	12/08/2017	120,000.00	YES

Action Effectiveness Definition

Value	Description
1) Prevent Reoccurrence	Action will Prevent Reoccurrence
2) Reduce Likelihood	Action will Reduce Likelihood of Reoccurrence
3) Lessen Impact	Action will Lessen Impact of Reoccurrence
4) Improvement / Unlikely to Prevent	An Improvement but not Likely to Prevent Reoccurrence
5) Impact Cannot be Determined	Action Impact Cannot be Determined at this Time



SunCoke Energy Environmental RCFA Report

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RCFA Name:	20171111_HHO_021_HRSG10_Tube_Leak	Report Date:	11/11/2017
Report #:	7577	Site:	HH
RCFA Facilitator:	KKEVANS	Location:	H-6110
RCFA Type:	Environmental	Location name:	HRSG 10, HEAT RECOVERY STEAM GEN, NOOTER, BATTERY D
Date of Occurrence:	Nov 11, 2017, 8:55 AM	Investigation Completed:	12/02/2017

Section1 - General Information

Executive Summary:

On November 11, 2017 at 8:55 am, a malfunction occurred on the HCC 2 Heat Recovery Steam Generator (HRSG) #10. The Evaporator Tubes 3, 7, and 12, located in Row 1 of Evaporator 1, failed, allowing water to pass from the tubes inside of the HRSG into the gas path, which was then converted to steam. As a result of the added mass flow of water and steam caused by the leaking tubes, the HCC 2 ID fans were unable to maintain sufficient draft on the HRSGs 8-10 bypass vent stacks, causing them to open, starting at 8:55 am.

The CRO immediately responded and closed the HRSGs #8 and 9 bypass vent stack lids at 8:59 am and 9:05 am, respectively. HRSG #8 remained offline for maintenance to address a prior tube leak; therefore, redundant HRSG #11 was not available to take the process gas from HRSG #10, which also had to remain offline for tube repairs. As a result, the HRSG #10 bypass vent stack lids remained open to allow contractor personnel to make repairs to HRSG #10. Contractor personnel worked around the clock to make the repairs in order to minimize bypass venting. Once those repairs were made, Operations personnel returned HRSG #10 to service and closed the HRSG #10 bypass vent stack lids at 8:50 pm on November 12, 2017. The total duration of the bypass venting event was 36.10 hours. Contractor personnel identified leaks in the HRSG #10 Evaporator 1 tubes 3, 7, and 12 of row 1.

The root cause of this bypass venting event was determined to be the failed evaporator tubes 3, 7, and 12, located in Row 1 of Evaporator 1 in HRSG #10, which resulted in a large increase in the mass flow to the HCC 2 ID fans, which were unable to respond quickly enough to the resultant water leak and mass flow increase, causing the loss of draft.

The major corrective actions identified for this event include plugging the failed evaporator tubes 3, 7, and 12 of Row 1 of Evaporator 1 in HRSG #10.



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Section 1a) Environmental Information

Did the stack lid bypass event result from planned FGD or HRSG maintenance?	No
Describe: The bypass venting was a result of a tube leak malfunction occurring, while another HRSG was already offline for maintenance.	

Were charge weights to affected ovens reduced to a 42.5 wet tons/oven average 48 hours prior to venting?	No
If no, provide explanation of why the charge weights were not reduced to a 42.5 wet ton average.	
Explanation: Bypass venting was a result of unplanned maintenance; therefore, charge weights could not be reduced at least 48 hours in advance. However, at the conclusion of bypass venting, charge weights had been reduced to an average of 43.51 tons across the affected ovens. Charge weight reduction was implemented on the affected ovens per Haverhill's Preventative Maintenance and Operations Plan.	

Did the coal charged during the bypass event contain less than 1.1% sulfur content?	Yes
If no, provide explanation of why the coal sulfur content was not reduced to a maximum of 1.1%.	
Explanation:	

Did multiple events involving stack lid open time occur within a 24 period?	Yes
If yes, please list the Maximo RCFA numbers here:	

P901					
Vent Stack No.	#1	#2	#3	#4	#5
Stack Lid Open Date/Time					
Stack Lid Close Date/Time					
Total Bypass Venting Time (mins)	0	0	0	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.00	0.00

P902					
Vent Stack No.	#6	#7	#8	#9	#10
Stack Lid Open Date/Time			11/11/2017 8:55	11/11/17 8:58	11/11/17 8:55
Stack Lid Close Date/Time			11/11/2017 8:59	11/11/17 9:05	11/12/17 20:50
Total Bypass Venting Time (mins)	0	0	4	7	2155
Total Bypass Venting Time (hrs)	0.00	0.00	0.07	0.12	35.92

Estimated Quantity of Emissions (tons)						
Pollutant:	Lead	0.0	PM	0.3	SO ₂	2.6

Estimated Avg Coal Sulfur Content Charged Per Day (applies to all ovens charged each day):				
Date	Avg S (%):		Date	Avg S (%):
11/9/2017	0.93		11/11/2017	0.95
11/10/2017	0.81		11/12/2017	0.86



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Estimated Avg Charge Tons per Oven Charged (avg over duration of event):			
No.	Estimated Avg Coal Charge Weight/		No. Estimated Avg Coal Charge Weight/
141	43.86		142 45.84
145	43.84		146 45.77
149	43.82		150 45.81
153	44.06		154 45.83
157	43.82		158 45.88
143	42.29		144 43.50
147	42.24		148 42.82
151	42.13		152 42.80
155	42.15		156 42.85
159	42.06		160 41.16
161	43.96		162 45.93
165	43.89		166 45.71
169	44.06		170 45.79
173	43.76		174 45.91
177	44.78		178 45.77
163	42.18		164 43.24
167	42.37		168 43.18
171	42.15		172 43.29
175	42.15		176 43.11
179	42.24		180 41.16
181	43.93		182 44.20
185	43.91		186 44.06
189	43.93		190 44.57
193	43.86		194 44.83
197	44.71		198 44.06
183	42.28		184 42.64
187	42.19		188 42.67
191	42.31		192 42.58
195	41.84		196 41.44
199	41.81		200 41.49

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 2

Emission Factors (for one bypass vent stack)*:

Lead	0.060 lb/hr	September 2016 Test, HNCC No. 2 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	141.9 lb/hr	Calculated from 2nd Half CEMs Data

Event Description: 20171111_HHO_021_HRSG10_Tube_Leak (7577)

Start Date/Time of Bypass Venting: 11/11/2017 8:55

End Date/Time of Bypass Venting: 11/12/2017 20:50

Bypass Vent Stack Lid Open and Close Date/Time:

	#6	#7	#8	#9	#10
Open Date/Time:			11/11/2017 8:55	11/11/17 8:58	11/11/17 8:55
Close Date/Time:			11/11/2017 8:59	11/11/17 9:05	11/12/17 20:50

Total Stack Lid Open Time per Bypass Vent Stack:

	#6	#7	#8	#9	#10
Hours:	0.0	0.0	0.1	0.1	35.9
Minutes:	0	0	4	7	2155

Total Bypass Venting Time:

Hours: 36.1

Minutes: 2166

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#6	#7	#8	#9	#10
Lead (lbs)	0.0	0.0	0.0	0.0	2.2
PM (lbs)	0.0	0.0	1.2	2.1	639.3
SO ₂ (lbs)	0.0	0.0	9.5	16.6	5096.6

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total tons of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.3
SO ₂ (tons)	2.6



Section 2 - Investigation Information and Summary

Cause and Effect Analysis (include steps taken to minimize emissions, if applicable):

On November 11, 2017 at 8:55 am, a malfunction occurred on the HCC 2 Heat Recovery Steam Generator (HRSG) #10. The Evaporator Tubes 3, 7, and 12, located in Row 1 of Evaporator 1, failed, allowing water to pass from the tubes inside of the HRSG into the gas path, which was then converted to steam. As a result of the added mass flow of water and steam caused by the leaking tubes, the HCC 2 ID fans were unable to maintain sufficient draft on the HRSGs 8-10 bypass vent stacks, causing them to open, starting at 8:55 am.

The CRO immediately responded and closed the HRSGs #8 and 9 bypass vent stack lids at 8:59 am and 9:05 am, respectively. HRSG #8 remained offline for maintenance to address a prior tube leak; therefore, redundant HRSG #11 was not available to take the process gas from HRSG #10, which also had to remain offline for tube repairs. As a result, the HRSG #10 bypass vent stack lids remained open to allow contractor personnel to make repairs to HRSG #10. Contractor personnel worked around the clock to make the repairs in order to minimize bypass venting. Once those repairs were made, Operations personnel returned HRSG #10 to service and closed the HRSG #10 bypass vent stack lid at 8:50 pm on November 12, 2017. The total duration of the bypass venting event was 36.10 hours. Contractor personnel identified leaks in the HRSG #10 Evaporator 1 tubes 3, 7, and 12 of row 1.

The root cause of this bypass venting event was determined to be the failed evaporator tubes 3, 7, and 12, located in Row 1 of Evaporator 1 in HRSG #10, which resulted in a large increase in the mass flow to the HCC 2 ID fans, which were unable to respond quickly enough to the resultant water leak and mass flow increase, causing the loss of draft.

The major corrective actions identified for this event include plugging the failed evaporator tubes 3, 7, and 12 of Row 1 of Evaporator 1 in HRSG #10.

HCC has been implementing other processes and procedures to minimize the occurrence of tube leaks and/or the amount of time that a HRSG is down for a tube leak. These processes and procedures include but are not limited to: an advanced tube inspection/tracking program that identifies areas of the boiler that are more prone to corrosion and may require more thorough tube inspections; an additional inspection process that allows personnel to inspect additional boiler tubes when a boiler is down for a tube leak or other unplanned event; the use of soda ash wash; the use of an ultrasonic thickness (UT) testing method to identify thinning tubes in order to target specific areas of the boiler for tube replacements or additional inspections, as needed; an orbital welding process for use on applicable repairs for more even, consistent welds on tubes; and the use of different, more resilient metallurgy in certain boiler sections.

These above processes and procedures were being followed at the time of this leak, so they should not be considered RCFA corrective actions.



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Section 3 - Causes

Cause	Description of Root Cause	Analysis of Root Cause (how did this contribute?)	Type of Cause	Cause Class Repeat?
1588	Failed HRSG #10 Evap 1 tubes 3, 7, and 12 of row 1	The failed Evaporator 1 tubes 3, 7, and 12 located in Row 1 in HRSG #10 with HRSG #8 already being shutdown resulted in operations not being able to gas share and keep all of the emergency bypass vent stacks closed.	Root Cause	Physical Cause NO

Section 4 - Measures Reasonably Available to Prevent or Reduce Likelihood of Recurrence (Corrective Actions)

CA#	Description of Corrective Action	Analysis of Corrective Action
1050061	CD - Plug HRSG 10 Evaporator 1 failed tubes 3, 7, and 12 of row 1	Plugging the failed HRSG 10 Evaporator 1 tubes 3, 7, and 12 of row 1 stopped the leak.

Additional Corrective Action Information:

CA#	Responsible Person	Probable Effectiveness	Estimated Start Date of CA	Estimated Completion Date	Estimated Cost of Implementation	3rd Party Needed for Implementation?
1050061	KKEVANS	2) Reduce Likelihood	11/11/2017	12/08/2017	80,000.00	YES

Action Effectiveness Definition

Value	Description
1) Prevent Reoccurrence	Action will Prevent Reoccurrence
2) Reduce Likelihood	Action will Reduce Likelihood of Reoccurrence
3) Lessen Impact	Action will Lessen Impact of Reoccurrence
4) Improvement / Unlikely to Prevent	An Improvement but not Likely to Prevent Reoccurrence
5) Impact Cannot be Determined	Action Impact Cannot be Determined at this Time



SunCoke Energy Environmental RCFA Report

SunCoke Energy
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RCFA Name:	20171127_HHO_022_HRSGs3 and4_Stack_Lid_Exercises	Report Date:	11/27/2017
Report #:	7650	Site:	HH
RCFA Facilitator:	DMSTARKWEATHER	Location:	HH1 HRSG
RCFA Type:	Environmental	Location name:	PLANT 1 HRSG
Date of Occurrence:	Nov 27, 2017, 12:01 PM	Investigation Completed:	12/07/2017

Section1 - General Information

Executive Summary:
On November 27, 2017, HCC maintenance personnel exercised the HCC 1 bypass vent stack lids as part of scheduled preventative maintenance activities, which are normally completed in less than 30 minutes. However, issues were identified during the maintenance, which minimally extended venting. During the inspection, maintenance personnel identified an issue with the pneumatic solenoid controls associated with the HRSG #3 east side stack lid. In addition, as the HRSG #4 stack lids were being closed, the metal flag used for position indication became entangled with the weighted cable that helps open the lid and the cable broke. Maintenance personnel repaired the cable and the HRSG #3 solenoid was replaced. In addition, the HRSGs #1, 2, and 5 stack lids were cycled open and closed to ensure proper functionality. The total duration of the bypass venting event was 0.66 hours. No additional corrective actions were identified or required as a result of this maintenance activity.



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Section 1a) Environmental Information

Did the stack lid bypass event result from planned FGD or HRSG maintenance?	No
Describe: The Bypass Venting Event was a result of conducting preventative maintenance of the HRSGs #1-5 Stack Lids.	

Were charge weights to affected ovens reduced to a 42.5 wet tons/oven average 48 hours prior to venting?	No
If no, provide explanation of why the charge weights were not reduced to a 42.5 wet ton average.	
Explanation: Bypass venting was not a result of scheduled HRSG or FGD maintenance and HRSG Bypass Venting was not expected to exceed 24 hours. Per the PMO plan, coal charge weights are reduced by approximately two tons per charging cycle during bypass venting events that are expected to exceed 24 hours.	

Did the coal charged during the bypass event contain less than 1.1% sulfur content?	Yes
If no, provide explanation of why the coal sulfur content was not reduced to a maximum of 1.1%.	
Explanation:	

Did multiple events involving stack lid open time occur within a 24 period?	Yes
If yes, please list the Maximo RCFA numbers here:	

*Less than 30 minutes of bypass venting occurred on HCC2 on November 27.

P901					
Vent Stack No.	#1	#2	#3	#4	#5
Stack Lid Open Date/Time	11/27/17 12:01	11/27/17 12:04	11/27/2017 12:09	11/27/17 12:26	11/27/17 13:01
Stack Lid Close Date/Time	11/27/17 12:01	11/27/17 12:04	11/27/2017 12:25	11/27/17 12:45	11/27/17 13:02
Total Bypass Venting Time (mins)	1	1	16	20	1
Total Bypass Venting Time (hrs)	0.02	0.02	0.26	0.33	0.02

P902					
Vent Stack No.	#6	#7	#8	#9	#10
Stack Lid Open Date/Time					
Stack Lid Close Date/Time					
Total Bypass Venting Time (mins)	0	0	0	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.00	0.00

Estimated Quantity of Emissions (tons)						
Pollutant:	Lead	0.0	PM	0.0	SO ₂	0.1

Estimated Avg Coal Sulfur Content Charged Per Day (applies to all ovens charged each day):					
Date	Avg S (%):		Date	Avg S (%):	
11/25/2017	0.89		11/27/2017	0.97	
11/26/2017	0.84				



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Estimated Avg Charge Tons per Oven Charged (avg over duration of event):					
No.	Estimated Avg Coal Charge Weight/		No.	Estimated Avg Coal Charge Weight/	
1	43.81		2	43.88	
5	43.62		6	43.71	
9	43.72		10	43.77	
13	43.74		14	43.81	
17	43.94		18	43.76	
3	41.07		4	42.32	
7	41.14		8	42.30	
11	41.23		12	42.25	
15	41.24		16	42.32	
19	41.18		20	41.38	
21	43.89		22	43.84	
25	43.86		26	43.72	
29	43.67		30	44.46	
33	43.81		34	44.03	
37	43.76		38	44.08	
23	41.33		24	41.28	
27	41.79		28	42.18	
31	41.16		32	40.17	
35	41.31		36	41.93	
39	41.24		40	40.20	
41	43.98		42	43.88	
45	43.76		46	43.77	
49	43.71		50	43.88	
53	44.06		54	43.64	
57	43.71		58	43.81	
43	41.19		44	41.82	
47	41.21		48	41.71	
51	41.19		52	41.73	
55	41.18		56	41.71	
59	41.18		60	40.32	
61	43.13		62	43.72	
65	43.14		66	-0.29	
69	43.76		70	43.73	
73	43.77		74	43.74	
77	43.19		78	43.96	
63	41.43		64	41.65	
67	41.29		68	41.72	
71	41.29		72	41.82	
75	41.19		76	40.94	
79	41.24		80	41.74	
81	43.36		82	43.74	
85	43.31		86	43.81	
89	43.23		90	43.88	
93	43.09		94	43.79	
97	43.21		98	43.62	
83	41.18		84	40.80	
87	41.09		88	41.79	
91	41.23		92	41.81	
95	41.14		96	40.73	
99	41.26		100	41.74	

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 1

Emission Factors (for one bypass vent stack):

Lead	0.141 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	156.1 lb/hr	Calculated from 2nd Half CEMs Data

Corresponding RCFA Report: 20171127_HHO_022_HRSGs3and4_Stack_Lid_Exercises (7650)

Start Date/Time of Bypass Venting: 11/27/2017 12:01

End Date/Time of Bypass Venting: 11/27/2017 13:02

Bypass Vent Stack Lid Open and Close Date/Time:

	#1	#2	#3	#4	#5
Open Date/Time:	11/27/17 12:01	11/27/17 12:04	11/27/2017 12:09	11/27/17 12:26	11/27/17 13:01
Close Date/Time:	11/27/17 12:01	11/27/17 12:04	11/27/2017 12:25	11/27/17 12:45	11/27/17 13:02

Total Stack Lid Open Time per Bypass Vent Stack:

	#1	#2	#3	#4	#5
Hours:	0.0	0.0	0.3	0.3	0.0
Minutes:	1	1	16	20	1

Total Bypass Venting Time:

Hours: 0.7

Minutes: 39

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#1	#2	#3	#4	#5
Lead (lbs)	0.0	0.0	0.0	0.0	0.0
PM (lbs)	0.4	0.4	4.7	5.8	0.4
SO ₂ (lbs)	3.1	3.1	41.1	50.9	3.9

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total lbs of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.1



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Section 2 - Investigation Information and Summary

Cause and Effect Analysis (include steps taken to minimize emissions, if applicable):
The maintenance team performed the work as expediently as possible in order to minimize stack lid open time, while also ensuring that the safety of plant personnel was not compromised.



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Section 3 - Causes

Cause	Description of Root Cause	Analysis of Root Cause (how did this contribute?)	Type of Cause	Cause Class	Repeat?
1589	HCC 1 scheduled bypass vent stack maintenance	The HCC 1 bypass vent stack lids were exercised as part of scheduled preventative maintenance (PM) activities. During the scheduled PM, maintenance personnel identified a bad solenoid on HRSG #3 and a damaged cable on HRSG #4.	Root Cause	Physical Cause	NO

Section 4 - Measures Reasonably Available to Prevent or Reduce Likelihood of Recurrence (Corrective Actions)

CA#	Description of Corrective Action	Analysis of Corrective Action
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Additional Corrective Action Information:

CA#	Responsible Person	Probable Effectiveness	Estimated Start Date of CA	Estimated Completion Date	Estimated Cost of Implementation	3rd Party Needed for Implementation?
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Action Effectiveness Definition

Value	Description
1) Prevent Reoccurrence	Action will Prevent Reoccurrence
2) Reduce Likelihood	Action will Reduce Likelihood of Reoccurrence
3) Lessen Impact	Action will Lessen Impact of Reoccurrence
4) Improvement / Unlikely to Prevent	An Improvement but not Likely to Prevent Reoccurrence
5) Impact Cannot be Determined	Action Impact Cannot be Determined at this Time



SunCoke Energy Environmental RCFA Report

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RCFA Name:	20171230_ HHO_023_HCC1_LOSS_OF_ DRAFT	Report Date:	12/30/2017
Report #:	7750	Site:	HH
RCFA Facilitator:	KKEVANS	Location:	HH1 HRSG
RCFA Type:	Environmental	Location name:	PLANT 1 HRSG
Date of Occurrence:	Dec 30, 2017, 12:55 AM	Investigation Completed:	01/22/2018

Section1 - General Information

Executive Summary:

This bypass venting event is a result of Redundant HRSG Tie in Time on HCC 1. Per paragraph 20.d. of the Consent Decree, information outlined in Paragraph 20.f. through 20.i. is not required to be completed for bypass venting events that are a result of Redundant HRSG Tie In Time.



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Section 1a) Environmental Information

Did the stack lid bypass event result from planned FGD or HRSG maintenance?	No
Describe: The Bypass Venting Event was a result of a brief disruption in power from the utility provider that caused the HCC1 variable frequency drives for the induced draft fans to trip on phase imbalance.	

Were charge weights to affected ovens reduced to a 42.5 wet tons/oven average 48 hours prior to venting?	No
If no, provide explanation of why the charge weights were not reduced to a 42.5 wet ton average.	
Explanation: Bypass venting was a result of unplanned maintenance; therefore, charge weights could not be reduced at least 48 hours in advance. HRSG Bypass Venting was not expected to exceed 24 hours. Per the PMO plan, coal charge weights are reduced by approximately two tons per charging cycle during bypass venting events that are expected to exceed 24 hours.	

Did the coal charged during the bypass event contain less than 1.1% sulfur content?	Yes
If no, provide explanation of why the coal sulfur content was not reduced to a maximum of 1.1%.	
Explanation:	

Did multiple events involving stack lid open time occur within a 24 period?	No
If yes, please list the Maximo RCFA numbers here:	

P901					
Vent Stack No.	#1	#2	#3	#4	#5
Stack Lid Open Date/Time	12/30/17 00:55	12/30/17 00:55	12/30/17 00:55	12/30/17 00:55	12/30/17 00:55
Stack Lid Close Date/Time	12/30/17 1:18	12/30/17 1:22	12/30/17 1:13	12/30/17 1:21	12/30/17 1:20
Total Bypass Venting Time (mins)	23	27	18	26	25
Total Bypass Venting Time (hrs)	0.38	0.45	0.30	0.43	0.42

P902					
Vent Stack No.	#6	#7	#8	#9	#10
Stack Lid Open Date/Time					
Stack Lid Close Date/Time					
Total Bypass Venting Time (mins)	0	0	0	0	0
Total Bypass Venting Time (hrs)	0.00	0.00	0.00	0.00	0.00

Estimated Quantity of Emissions (tons)						
Pollutant:	Lead	0.0	PM	0.0	SO ₂	0.2

Estimated Avg Coal Sulfur Content Charged Per Day (applies to all ovens charged each day):					
Date	Avg S (%):		Date	Avg S (%):	
12/28/2017	0.76		12/30/2017	0.74	
12/29/2017	0.87				



SunCoke Energy Environmental RCFA Report

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Estimated Avg Charge Tons per Oven Charged (avg over duration of event):

No.	Estimated Avg Coal Charge Weight/	No.	Estimated Avg Coal Charge Weight/
1	44.25	2	41.09
5	44.25	6	41.11
9	44.05	10	41.14
13	44.17	14	41.21
17	44.17	18	41.23
3	41.59	4	41.16
7	40.20	8	40.59
11	40.32	12	-0.29
15	40.06	16	40.61
19	40.12	20	40.75
21	44.22	22	41.19
25	44.13	26	41.23
29	44.22	30	41.21
33	44.06	34	41.23
37	44.22	38	41.21
23	40.29	24	40.66
27	40.05	28	40.65
31	40.15	32	40.59
35	40.20	36	40.68
39	40.20	40	40.83
41	44.25	42	41.11
45	44.12	46	41.23
49	44.22	50	41.18
53	44.25	54	41.28
57	40.15	58	41.14
43	40.03	44	40.61
47	40.10	48	40.59
51	40.05	52	40.68
55	40.20	56	40.73
59	40.20	60	40.66
61	40.08	62	41.18
65	40.06	66	41.24
69	40.20	70	41.14
73	40.13	74	41.11
77	40.13	78	41.18
63	40.13	64	40.75
67	40.22	68	40.70
71	40.18	72	40.68
75	40.13	76	40.66
79	40.15	80	40.63
81	40.24	82	41.24
85	40.30	86	41.14
89	40.01	90	41.21
93	40.15	94	41.20
97	39.96	98	41.23
83	40.12	84	40.59
87	40.24	88	40.63
91	40.12	92	40.63
95	40.25	96	4.70
99	40.22	100	40.73

Bypass Venting Emissions Calculations for Haverhill Coke Company No. 1

Emission Factors (for one bypass vent stack):

Lead	0.141 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
PM (Filt + Cond)	17.8 lb/hr	May 2016 Test, HNCC No. 1 FGD Outage
SO ₂	156.1 lb/hr	Calculated from 2nd Half CEMs Data

Corresponding RCFA Report: 20171230_HHO_023_HCC1_Loss_of_Draft (7750)

Start Date/Time of Bypass Venting: 12/30/2017 0:55

End Date/Time of Bypass Venting: 12/30/2017 1:22

Bypass Vent Stack Lid Open and Close Date/Time:

	#1	#2	#3	#4	#5
Open Date/Time:	12/30/17 00:55	12/30/17 00:55	12/30/17 00:55	12/30/17 00:55	12/30/17 00:55
Close Date/Time:	12/30/17 1:18	12/30/17 1:22	12/30/17 1:13	12/30/17 1:21	12/30/17 1:20

Total Stack Lid Open Time per Bypass Vent Stack:

	#1	#2	#3	#4	#5
Hours:	0.4	0.4	0.3	0.4	0.4
Minutes:	23	27	18	26	25

Total Bypass Venting Time:

Hours: 2.0

Minutes: 119

Calculation of Bypass Venting Emissions:

Emissions = Emission Factor (lb/hr) x Total Hours of Bypass Venting x 1 ton/2000 lbs

	#1	#2	#3	#4	#5
Lead (lbs)	0.1	0.1	0.0	0.1	0.1
PM (lbs)	6.8	8.0	5.3	7.7	7.4
SO ₂ (lbs)	59.8	70.2	46.8	67.6	65.0

Total Emissions from Bypass Venting Event

Total Emissions = Sum of Emissions from Each Affected Bypass Vent Stack

Total lbs of Pollutant Emitted During Bypass Venting

Lead (tons)	0.0
PM (tons)	0.0
SO ₂ (tons)	0.2